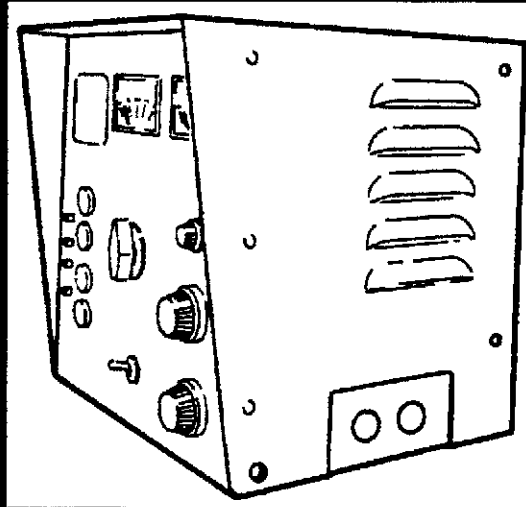


# Installation and Service Manual

## 12 and 24 Volt Battery Charger



**Models**  
**305-0812, 305-0813**

# Safety Precautions

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This manual includes the following symbols to indicate potentially dangerous conditions to the operator or equipment. Read the manual carefully and know when these conditions exist. Then take the necessary steps to protect personnel and the equipment.

**▲ DANGER** *This symbol warns of immediate hazards that will result in severe personal injury or death.*

**▲ WARNING** *This symbol refers to a hazard or unsafe practice that can result in severe personal injury or death.*

**▲ CAUTION** *This symbol refers to a hazard or unsafe practice that can result in personal injury or product or property damage.*

## IMPORTANT SAFETY INSTRUCTIONS

1. Save these instructions. This manual contains important safety and operating instructions.
2. Working in the vicinity of a battery is dangerous. Batteries generate explosive gasses during normal battery operation. For this reason, it is of utmost importance that each time before using the battery charger, you read all instructions and cautionary markings on the battery charger, the battery, and the generator set.
3. To reduce the risk of battery explosion, follow these instructions and those published by the battery manufacturer and the manufacturer of any equipment that is used in the vicinity of the battery. Review and follow all cautionary markings on these products.
4. CAUTION - To reduce risk of injury, only use the battery charger to charge rechargeable batteries. Other types of batteries (such as dry cell batteries) can burst, causing personal injury and property damage.
5. Never smoke or allow an open spark, arcing equipment or flame in the vicinity of the battery or generator set.
6. Do not expose the battery charger to rain, snow or other precipitation.
7. Never charge a frozen battery.
8. Use of an attachment not recommended or sold by the battery charger manufacturer can result in a risk of fire, electric shock, or personal injury.
9. Do not operate the battery charger if it has received a sharp blow, been dropped, or otherwise damaged in any way; take it to a qualified service technician.
10. The battery charger must be disassembled and serviced only by a qualified service technician. Incorrect reassembly can result in a risk of electric shock or fire.
11. To reduce the risk of electrical shock, disconnect the battery charger from AC power before performing any maintenance or cleaning. Turning off controls does NOT reduce this risk.
12. If it is necessary to remove the battery from the generator set battery tray to charge, always remove the grounded (-) terminal from the battery first. Make sure that all switches on the generator set control panel are off in order to prevent an arc.
13. Study all battery manufacturer's specific precautions, such as removing or not removing cell caps while charging and recommended rates of charge.
14. Do not use the battery charger unless the battery voltage matches the output voltage rating of the charger. Refer to the generator set operator's manual to determine the voltage of the battery.
15. Never place the charger directly above or below the battery; gases or fluids from the battery can corrode and damage the charger. Locate the charger as far away from the battery as practical.
16. Do not operate the battery charger in a closed-in area or restrict ventilation in any way.
17. Grounding Instructions: This battery charger should be connected to a grounded, metal, permanent wiring system; or an equipment-grounding conductor should be run with circuit conductors and connected to an equipment-grounding terminal or lead on the battery charger. Connections to the battery charger must comply with all local codes and ordinances.

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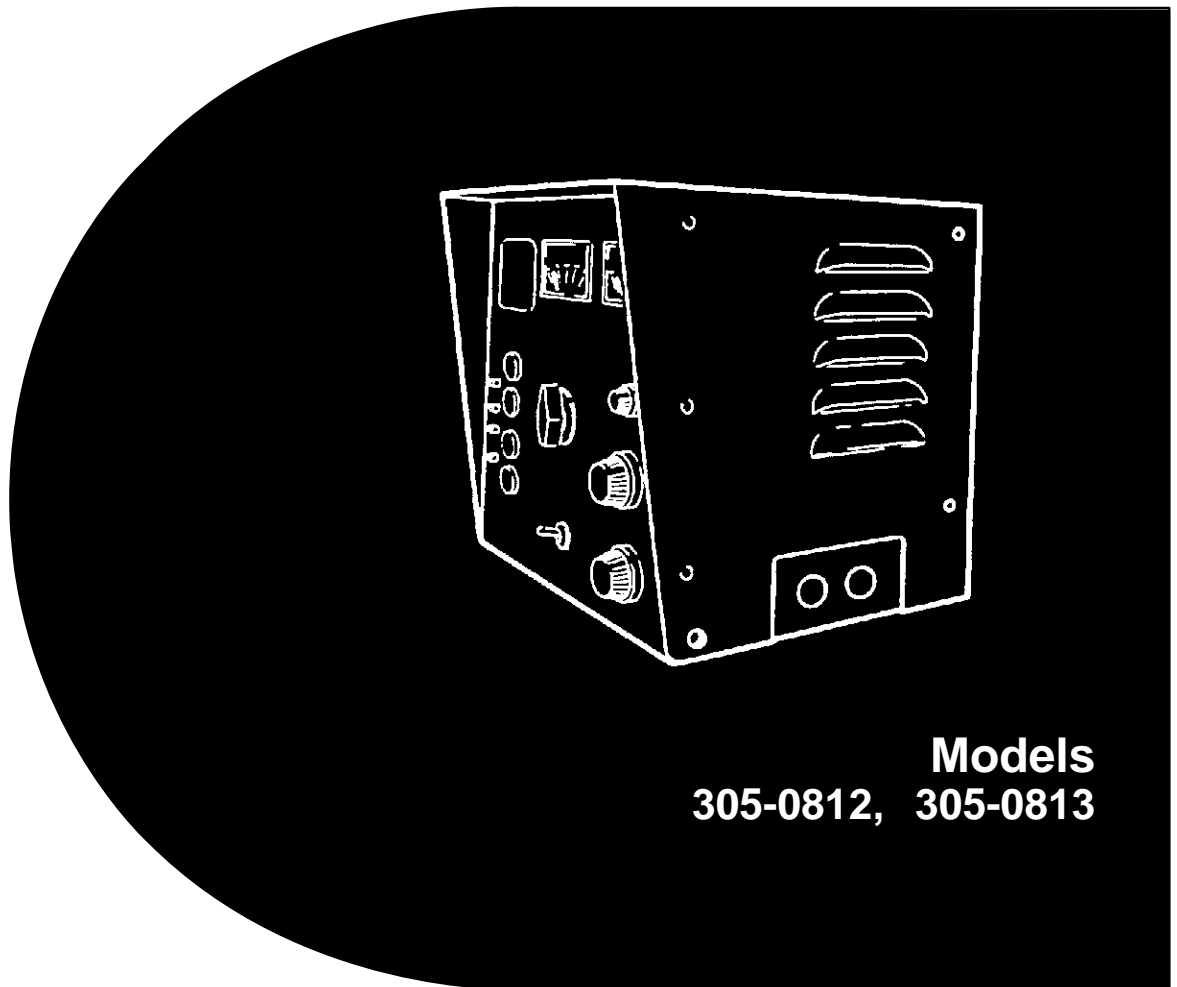
**⚠WARNING**

***INCORRECT SERVICE OR REPLACEMENT OF PARTS CAN RESULT IN DEATH, SEVERE PERSONAL INJURY, AND/OR EQUIPMENT DAMAGE. SERVICE PERSONNEL MUST BE QUALIFIED TO PERFORM ANY SERVICE.***



# Installation and Service Manual

## 12 and 24 Volt Battery Charger



**Models**  
**305-0812, 305-0813**

# Installation

## MOUNTING

**⚠ WARNING** *AC voltages present an electrical shock hazard that can cause severe personal injury or death. Make sure that the AC power source is disconnected before proceeding.*

The battery charger can be mounted on a wall or on a horizontal surface, such as a bench.

Charger specifications are listed in Table 1.

Choose a vibration-free mounting surface that will support the weight of the charger. Avoid locations that are near flammable liquids or gases or are hot (140°F/60°C or above), moist, or dusty.

**⚠ CAUTION** *To avoid damage to the charger, do not mount it directly above or below the battery.*

Do not place the charger directly above or below the battery; gases or fluids from the battery can corrode and damage the charger. Locate the charger as far away from the battery as practical.

Do not mount the battery charger in a closed-in area or restrict ventilation in any way. Under full-load conditions, the top and back surfaces of the battery charger cabinet can become hot.

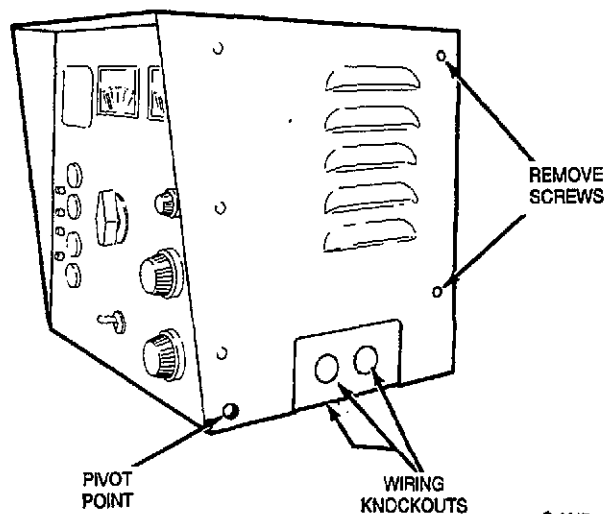
This battery charger should be installed so that it is not likely to be contacted by people.

**TABLE 1. CHARGER SPECIFICATIONS**

Available Output VDC (Refer to Nameplate)	12 or 24 VDC
Available Input VAC	120 to 600 VAC
Output Current	10 Amps
Weight (Approximate)	20 lbs (9 kg)
Height	8.5 in. (216 mm)
Width	9.9 in. (251 mm)
Depth	8.75 in. (178 mm)

## Wall Mounting

1. Make sure that the AC power source is disconnected.
2. Check the location to be sure that no wires, plumbing, or gas or exhaust lines run behind the wall.
3. Open the charger cabinet by removing two screws on each side of the cabinet, as shown in Figure 1. Carefully pivot the top of the cabinet away from the base.
4. Install two 1/4-inch (6.35 mm) diameter mounting bolts in the wall for the top mounting keyholes. The center-to-center spacing of the mounting keyholes (Figure 2) is 7 inches (178 mm).
5. Mount the charger on the two mounting bolts in the wall, but do not tighten.
6. Mark the location of the two lower mounting holes.
7. Remove the charger and drill the two lower mounting holes.
8. Mount the charger on the top two mounting bolts.
9. Install the two lower mounting bolts.
10. Tighten all mounting bolts.



**FIGURE 1. CABINET EXTERIOR**

C-1117

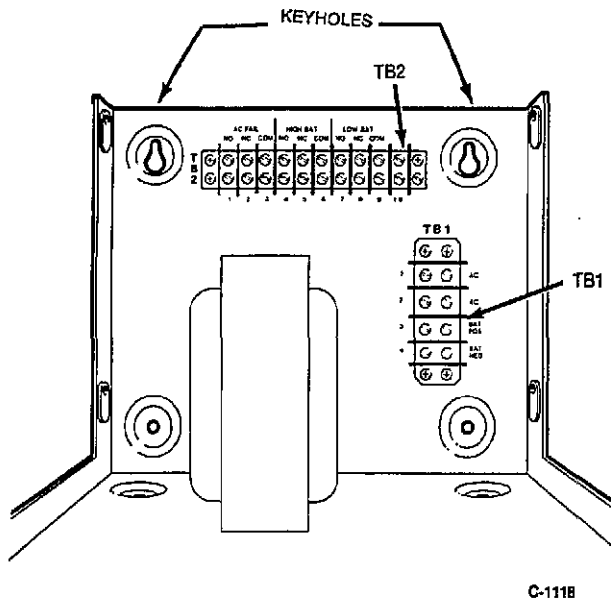


FIGURE 2. CABINET INTERIOR

### Bench Mounting

1. Make sure that the AC power source is disconnected.
2. Open the charger cabinet by removing two screws on each side of the cabinet, as shown in Figure 1. Carefully pivot the top of the cabinet away from the base.
3. Position the charger on the mounting surface.
4. Mark the location of the mounting holes.
5. Remove the charger and drill the mounting holes.
6. Position the charger on the mounting surface.
7. Install the mounting bolts.
8. Tighten the mounting bolts.

### WIRING

This battery charger should be connected to a grounded, metal, permanent wiring system; or an equipment-grounding conductor should be run with circuit conductors and connected to an equipment-grounding terminal or lead on the battery charger. Connections to the battery charger must comply with all local codes and ordinances.

**⚠ WARNING** AC voltages present an electrical shock hazard that can cause severe personal injury or death. Make sure that the AC power source is disconnected before proceeding.

1. Make sure that the AC power source is disconnected.
2. Remove the ground (-) cable of any battery that will be connected to the charger.

**⚠ WARNING** Ignition of explosive battery gases can cause severe personal injury. Do not smoke or cause any spark, arc, or flame while servicing batteries.

3. Place the charger power switch in the Off position.
4. Open the charger cabinet by removing two screws on each side of the cabinet, as shown in Figure 1. Carefully pivot the top of the cabinet away from the base.
5. Connect AC input wires to terminals 1 and 2 of TB1 (Figure 2). Connect the positive wire to terminal 3 of TB1 (Figure 2). Connect the negative battery wire to terminal 4 of TB1 (Figure 2). Connect a 16 AWG or larger ground wire to the grounding stud on the rear of the cabinet.

#### For DC connections:

- Use 16 AWG or larger wire up to 25 feet.
- Use 14 AWG or larger wire up to 40 feet.
- Use 12 AWG or larger wire up to 60 feet.
- Use 10 AWG or larger wire up to 100 feet.

#### For AC connections:

- Use 16 AWG or larger wire up to 100 feet.

Wiring must comply with all applicable codes. Wiring knockouts are provided on the side and bottom of the cabinet (Figure 1). Make sure wiring does not run over any rough, sharp, or hot surfaces. Use conductors rated at 90°C or higher, for wiring inside the charger cabinet.

6. If required, connect the High Bat, Low Bat, and AC Fail alarm contacts to the appropriate (common, normally open, and normally closed) terminals of TB2 (Figure 2).

The labels on the relay contact terminal block indicate contact position when the relays are de-energized. Under normal operating conditions, the Low Bat and AC Fail relays are energized and the High Bat relay is de-energized.

The alarm contacts are rated for 4 amperes at 120 VAC or 30 VDC. Wiring must comply with all applicable codes.

7. Close and secure the charger cabinet.
8. Connect the DC output wires to the battery (negative [-] lead last).

**⚠ WARNING** Ignition of explosive battery gases can cause severe personal injury. Do not smoke or cause any spark, arc, or flame while servicing batteries.

9. Connect AC power to the charger.

**⚠ WARNING** AC voltages present an electrical shock hazard that can cause severe personal injury or death. Take special care to avoid contact with a hot AC line.

# Operation

## DESCRIPTION

All controls, meters, indicators and fuses are accessible from the front panel of the battery charger (Figure 3). In addition to these external components, three sets of alarm relay contacts are also available.

If the battery voltage rises above an adjustable maximum voltage level or drops below an adjustable minimum voltage level for 90 seconds, a corresponding (High Bat. or Low Bat.) red alarm LED is lit and a corresponding set of form C relay contacts is activated.

If the AC input voltage fails, a red AC Failure LED is lit and a corresponding set of form C relay contacts is activated.

## Controls

**Power On/Off switch:** Controls both AC and DC power circuits.

**Equalize Charge Timer:** When this timer is set, the charger's DC output voltage is increased (to an adjustable level) until the timer expires (up to 12 hours). To use this timer, turn the indicator past 2 and then set the desired time.

**Equalize Voltage adjustment potentiometer:** Used to adjust the (factory-set) equalize voltage. The equalize voltage is the higher of the two charge voltages.

**Float Voltage adjustment potentiometer:** Used to adjust the (factory-set) float voltage. The float voltage is the lower of the two charge voltages.

**High Alarm adjustment potentiometer:** Used to adjust the (factory-set) maximum battery (High Bat.) alarm voltage.

**Low Alarm adjustment potentiometer:** Used to adjust the (factory-set) minimum battery (Low Bat.) alarm voltage.

The high and low alarm and float and equalize voltage adjustments are set at the factory. Adjustment procedures are described under *Adjustments*.

## Meters

**DC Ammeter:** Indicates the charger output current. It is normal for the ammeter indicator to jump between 0 and 2 amperes when the battery is at its float voltage.

**DC Voltmeter:** Indicates the voltage at the battery.

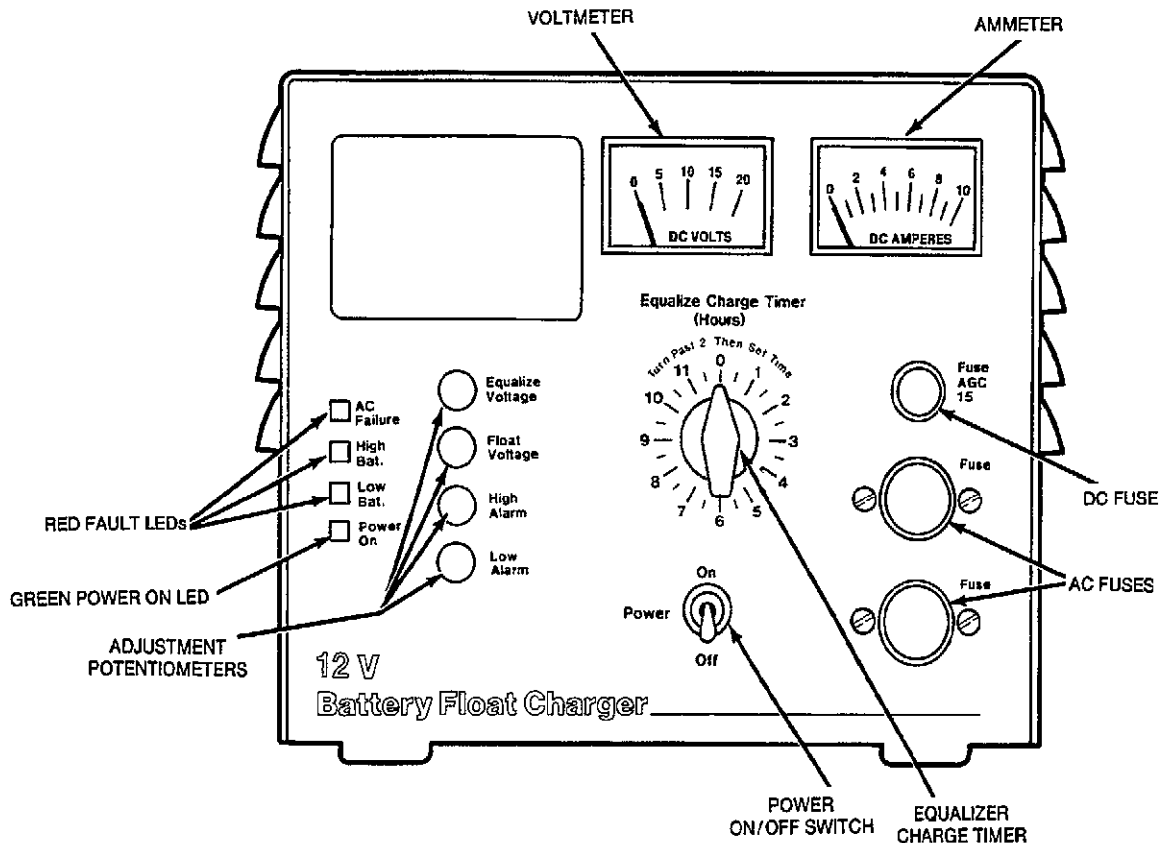


FIGURE 3. BATTERY CHARGER

C-1119



## LED Indicator Lamps

**Power On LED:** This green LED indicates that there is AC power to the charger.

**High Bat LED:** This red LED indicates that battery voltage has exceeded a pre-set maximum level.

**Low Bat LED:** This red LED indicates that battery voltage has fallen below a pre-set minimum level.

**AC Failure LED:** This red LED indicates that there is no AC power to the charger.

If a red LED is illuminated, refer to the *Troubleshooting* section.

## Fuses

**DC output fuse:** 15 Amp AGC

**AC input fuses:** The AC fuse rating and type (FNQ or KTK) is indicated on the front panel, next to the corresponding fuse holder.

When replacing blown fuses, be sure to use a fuse of the same rating and type. Do not use fuses with a higher rating.

## Alarm Contacts

Three sets of (form C) alarm relay contacts (corresponding to the three red fault LEDs) are also available. These contacts can be wired by the installer to activate other audible or visual alarms.

Under normal operating conditions, the Low Bat and AC Fail relays are energized and the High Bat relay is de-energized. In response to a Low Bat or AC Fail condition, the appropriate normally energized relay (Low Bat or AC Fail) drops out. In response to a High Bat condition, the normally de-energized High Bat relay is energized.

The alarm contacts are rated for 4 amperes at 120 VAC or 30 VDC.

## BATTERY CHARGING

**Power On - Float Charge:** Turn the power switch to ON to charge the connected battery to the float voltage. The charger's electronic sensor checks the battery voltage. If the battery voltage is below the reference level, the charger supplies charging current to the battery. As the battery approaches a pre-set full charge voltage, charging current automatically tapers to zero.

The charger can be powered on a continuous basis to maintain the battery in a fully charged condition.

**Equalize Charge Timer:** For faster charging or to equalize the battery's cells, a higher charging voltage by switching is on the equalize charge timer. Turning on the obtained timer raises the charger output voltage for the selected time interval (up to 12 hours). At the end of the timed charging period, the charger automatically switches back to the float voltage.

To use this timer, turn the indicator past 2 and then set the desired time.

Most lead-acid battery manufacturers recommend equalize charging each month. Use the equalize charge timer to equalize float charged lead-acid batteries at intervals recommended by the battery manufacturer. Nickel-cadmium batteries do not require equalize charging.

# Service

## ADJUSTMENTS

### Battery Charger Float and Equalize Voltages

The float and equalize voltages are set at the correct values at the factory and should not require adjustment. However, if the battery shows signs of being overcharged or undercharged, these voltages can be adjusted. A high specific gravity, bubbling of electrolyte, and loss of water indicate a high charge voltage. A low specific gravity indicates a low charge voltage.

To change the float voltage, a fully charged battery, a hydrometer, a small screwdriver, and an accurate voltmeter (0.5% accuracy) are needed. Use the following procedures to adjust the float voltage:

1. Turn the battery charger power switch to Off. Turn the operation selector for the generator set to STOP and disconnect the starting battery (negative [-] lead first). The selector switch is located on the generator set control panel.

**▲WARNING** *Ignition of explosive battery gases can cause severe personal injury. Do not smoke or cause any spark, arc, or flame while servicing batteries.*

2. Connect the fully charged battery to the charger (negative [-] lead last) and verify the charge condition with the hydrometer. A fully charged lead-acid battery will have a specific gravity of 1.260 at 77°F (25°C).

**▲WARNING** *Battery electrolyte can cause severe eye damage and burns to the skin. Wear goggles, rubber gloves and a protective apron when working with batteries.*

3. Connect the voltmeter directly to the battery terminals. Turn the charger power switch to On, and measure the voltage.
4. Compare the voltage reading with the float value shown in Table 2. If the voltage is above or below the recommended float voltage, adjust as specified in step 5. If the voltage is correct, proceed to step 6.
5. Remove the plastic plug that covers the float adjustment potentiometer. Use a small screwdriver to turn the float adjustment potentiometer counterclockwise to decrease the float voltage and clockwise to increase the float voltage. Adjust in small steps and wait five minutes for the voltage to stabilize before making additional adjustments.

TABLE 2. FLOAT/EQUALIZE VOLTAGES

Lead-Acid Batteries		
Battery Voltage	*Float Voltage	Equalize Voltage
12	13.3	14.4
24	26.6	28.8
Nickel-Cadmium Batteries Float Voltage Charge Per Cell		
1.38 to 1.45		
Example: Float charge for 10 cell battery should be 13.8 to 14.5 volts.		
*Voltages shown are for ambient temperatures of 50°F (10°C) to 85°F (30°C). Reduce float voltage by 1% for every 9°F (5°C) above 85°F (29°C). Increase float voltage by 1% for every 9°F (5°C) below 50°F (10°C).		

6. After the float adjustment is completed, set the equalize timer to equalize charge the battery and wait until the charger current falls below 5 amperes.
  7. Compare the voltage reading with the equalize value shown in Table 2. If the voltage is above or below the recommended equalize voltage, adjust as specified in step 8. If the voltage is correct, proceed to step 9.
  8. Remove the plastic plug that covers the equalize adjustment potentiometer. Use a small screwdriver to turn the equalize adjustment potentiometer counterclockwise to decrease the equalize voltage and clockwise to increase the equalize voltage. Adjust in small steps and wait five minutes for the voltage to stabilize before making additional adjustments.
  9. When adjustments are complete, turn the charger power switch to Off and replace the plastic plugs.
  10. Disconnect the voltmeter from the battery terminals and disconnect the test battery from the charger (negative [-] lead first).
- ▲WARNING** *Ignition of explosive battery gases can cause severe personal injury. Do not smoke or cause any spark, arc, or flame while servicing batteries.*
11. Reconnect the generator set starting battery (negative [-] lead last) and place the operation selector switch in the Remote position. Turn the charger power switch to On and reset the equalizer timer to zero for float charging.

## Alarm Relay Settings

If the battery voltage rises above the High alarm setting or drops below the Low alarm setting for 90 seconds, the corresponding (high or Low) battery alarm LED is lit and a corresponding (optional) set of form C relay contacts is activated.

The high and low alarm adjustments are set at the factory. The ranges and factory settings are:

### 12-volt charger-

9 VDC to 13 VDC (Low Alarm)  
Factory Setting: 12.5 VDC

14 VDC to 19 VDC (High Alarm)  
Factory Setting: 14.5 VDC

### 23-volt charger-

18 VDC to 25 VDC (Low Alarm)  
Factory Setting: 25 VDC

27 VDC to 36 VDC (High Alarm)  
Factory Setting: 29 VDC

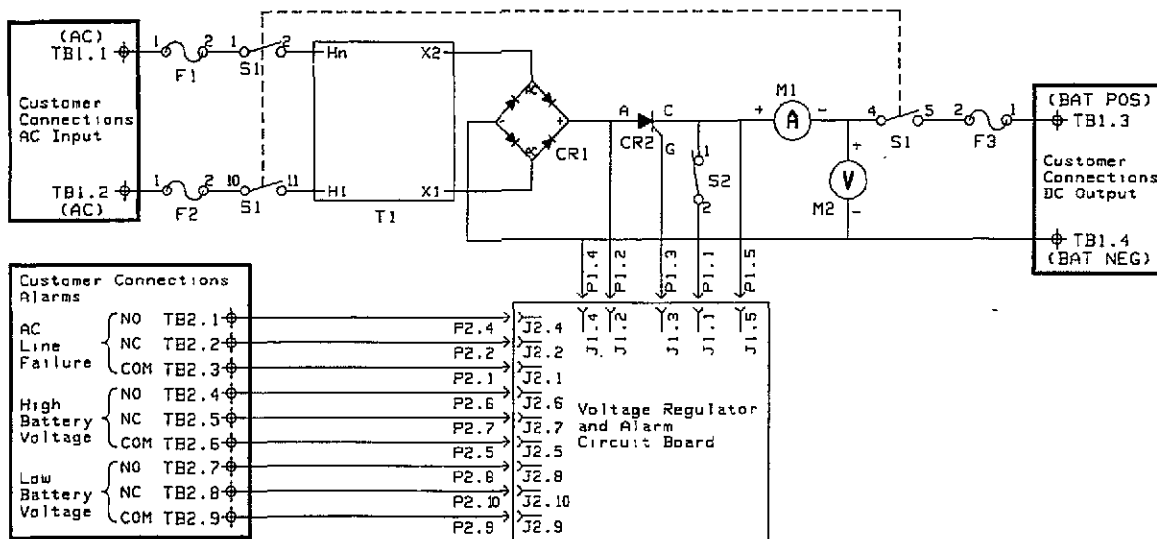
1. Remove the plastic plugs that cover the adjustment potentiometers.
2. Use a small screwdriver to turn the High Alarm or Low Alarm adjustment potentiometers on the charger panel counterclockwise to decrease the alarm voltage and clockwise to increase the alarm voltage.

The graduations on the adjustment potentiometers are approximate.

3. When finished, replace the plastic plugs.

## TROUBLESHOOTING

The following procedures (Table 3) describe preliminary troubleshooting checks. Figure 4 is a schematic of the charger circuitry. The internal components of the charger are illustrated in the *Parts manual*.



ES-1847

FIGURE 4. SCHEMATIC DIAGRAM

**⚠WARNING** Voltages within the charging system present an electrical shock hazard that can cause severe personal injury or death. Disconnect all sources of AC and DC power from the battery charger before servicing.

**⚠WARNING** Ignition of explosive battery gases can cause severe personal injury. Do not smoke or cause any spark, arc, or flame while servicing batteries.

**TABLE 3. TROUBLESHOOTING PROCEDURES**

TROUBLE	POSSIBLE CAUSE	CORRECTIVE ACTION
No DC Output.	<ol style="list-style-type: none"> <li>Blown DC fuse F3.</li> <li>Blown AC fuse(s). F1/F2. AC Failure LED will be lit.)</li> <li>Defective switch S1.</li> <li>Defective transformer T1.</li> <li>Defective rectifier CR1.</li> <li>Defective control rectifier (SCR) CR2.</li> <li>Defective regulator assembly A1.</li> </ol>	<ol style="list-style-type: none"> <li>Correct possible overload and replace fuse - use fuse of same type and rating.</li> <li>Replace fuse(s) - use fuse(s) of same type and rating.</li> <li>Replace switch.</li> <li>Secondary output voltage at full load should be: 11.5 to 14.5 VAC for the 12 VDC unit and 23 to 29 VAC for the 24 VDC unit. Replace if defective.</li> <li>Use ohmmeter to check each element (diode). Resistance must be high in one direction (polarity) and low in the other. Replace if defective.</li> <li>Check by replacement.</li> <li>Check by replacement.</li> </ol>
Low DC output.	<ol style="list-style-type: none"> <li>Incorrectly set float or equalize voltages. (Low Bat. LED may be lit.)</li> <li>Faulty battery. (Low Bat. LED LED may be lit.)</li> <li>Charger failure. (Low Bat. LED may be lit.)</li> </ol>	<ol style="list-style-type: none"> <li>Refer to voltage adjustment procedures.</li> <li>Replace battery - procedure is described below.</li> <li>Refer to No DC Output steps 4, 5, 6, and 7.</li> </ol>
High DC output.	<ol style="list-style-type: none"> <li>Incorrectly set float or equalize voltages. (High Bat. LED may be lit.)</li> <li>Charger failure (High Bat. LED may be lit.)</li> </ol>	<ol style="list-style-type: none"> <li>Refer to voltage adjustment procedures.</li> <li>Refer to No DC Output steps 4, 5, 6, and 7.</li> </ol>

**⚠WARNING**

*Voltages within the charging system present an electrical shock hazard that can cause severe personal injury or death. Disconnect all sources of AC and DC power from the battery charger before servicing.*

**⚠WARNING**

*Ignition of explosive battery gases can cause severe personal injury. Do not smoke or cause any spark, arc, or flame while servicing batteries.*

**TABLE 3. TROUBLESHOOTING PROCEDURES (Continued)**

TROUBLE	POSSIBLE CAUSE	CORRECTIVE ACTION
Float charge rate only.	<ol style="list-style-type: none"> <li>1. Defective Equalizer timer.</li> <li>2. Defective regulator assembly A1.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check that timer contacts open when timer is operating. Replace if defective.</li> <li>2. Check by replacement.</li> </ol>
Equalize charge rate only.	<ol style="list-style-type: none"> <li>1. Defective Equalize timer.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check that timer contacts close when timer is not operating. Replace if defective.</li> </ol>

### Battery Replacement

**⚠WARNING**

*Ignition of explosive battery gases can cause severe personal injury. Do not smoke or cause any spark, arc, or flame while servicing batteries.*

1. Turn the battery charger power switch to Off. Turn the operation selector for the generator set to STOP and disconnect the starting battery (negative [-] lead first). The selector switch is located on the generator set control panel.

2. Connect the replacement starting battery (negative [-] lead last) and place the operation selector switch in the Remote position. Turn the charger power switch to On. If the battery is fully charged and equalize charging is not required, set the equalizer timer to zero for float charging.





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